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FROZEN DESSERT
[DESSERT GLACE]

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TITLE (54): FROZEN DESSERT

FOREIGN TITLE [54A]: DESSERT GLACE

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This invention relates to a frozen dessert. The frozen dessert of the invention is of the type that primarily contains milk proteins, fats, sweetening agents, and one or more stabilizing agents.

The frozen dessert of the invention may, as needed, contain flavoring agents, dyes, or edible inclusions, or it may be featured inside pastries, e.g., with a covering layer of pastry dough.

These products are typically obtained by freezing the components listed above, and storing them until they are eaten, assuming that they are kept deep-frozen; the freezing temperature may be as low as minus 18° and even minus 24° Celsius.

Given this fact, the obtained products have an especially hard consistency that prevents them from being eaten immediately and makes it impossible, or at least difficult, to be scooped out unless they are allowed to warm up.

For large portions, when the portion has not been entirely eaten, keeping it after it has been warmed up in order to be divided out assumes refreezing, which affects the product's structure, creating large crystals that yield a watery taste and a harder, more noticeable texture; it also involves bacteriological risks.

Moreover, after these products have warmed to consumption temperature, they lose some of their stability and taste. The prior art has proposed solutions;

GB Patent 1563191 proposes an ice cream that is scoopable at freezing temperature and whose composition includes stabilizing agents and glycerol-type products, which lower the freezing point.

GB Patent 2019187 describes a preparation that is analogous to the previous patent wherein, in addition to stabilizers and glycerol-type products, the sweetening agents used are low-molecular-weight sweeting agents such as sucrose, glucose, fructose, and invert sugar, which are included in the composition due to their ability to lower its freezing point.

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US Patent 4,400,406 (MORLEY 8.83) relates to a frozen dessert that can be extruded; however, in the section relating to extruding the ice cream, there is no reference made to the temperature, which is most likely to be around -5 to 6°C. Extrusion at -20°C is not mentioned.

According to Example Six, coconut oil is used; the latter's melting point is high, at a rate of 11%. Under these conditions, coconut oil yields a hard, nonscoopable product.

In the composition of MORLEY U.S. Patent 4,400,406, the authors use a mixture of fructose, sorbitol, and corn syrup (can

be replaced with hydrolyzed starch or invert sugar). The selection of corn syrup is a traditional choice. The presence of sorbitol is justified by a need to compensate for the low level of fructose, which otherwise gives the product an overly-sweet flavor.

With regard to the choice of stabilizer, US Patent 4,400,406 mentions the quasi-exhaustive list of all known products in the field. The product of the invention is characterized by a specific choice of stabilizer percentage and by an explicit combination of three different stabilizers, including gelatin or an equivalent.

US Patent 4,421,778 (KAHN 12/83) relates to a milkshake-type product that is aerated so that can then be stored at a temperature such that it is frozen and scoopable or extrudable at this temperature.

This US patent relates to an aerated product, which therefore contains a large quantity of air: it mentions that the product can be kept for six months without losing much volume corresponding to deflation and subsidence of the product.

Concerning fats, KAHN cites the use of a specific fat that prevents the formation of crystal faces and therefore the crystallization of fats.

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US Patent 4,853,243 (KAHN 8/89) relates to an aerated product whose originality involves limiting crystallization. The philosophy is to use a premix that is processed thereafter, after it is frozen and aerated. It also relates to a product that is similar to the preceding one and the freezing-temperature scoopability results from its high air content. We wish to note that the author does not give any importance to the melting point of the fats used nor to the selection of sugars in the sweetening mixture.

GB patent A 1,563,191 (UNILEVER 3/80) describes a lowering of the freezing point by using a mixture of stabilizing agents and polyols (glycerol or sorbitol).

It has proven to be the case that the stabilizers must be used in such high proportions that the mouth-feel and taste of the obtained product may be altered, as well as its appearance, which may become gummy with a fatty taste.

Likewise, the use of low-molecular-weight sweetening agents may affect the taste of the product if the composition of the sweetening agents is not carefully controlled.

The polyols or glycerols used for lowering the freezing point also involve the disadvantage of not being digestible by humans and of having a laxative effect.

This invention aims to eliminate these disadvantages while creating a frozen dessert that is scoopable at freezing

temperature and that can be packaged in a pressurized container. This result is obtained by selecting a vegetable fat with a very low melting point and by selecting a mixture of specific low-molecular-weight sweeteners and by mixing them with milk proteins.

To do this, the frozen dessert of the invention, whose composition includes milk proteins, fats, sweeteners, and one or more stabilizing agents, is essentially characterized in that:

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- the proteins are provided by milk-origin milk replacing products and/or skim milk having 20% to 40% protein in relation to the raw product;
- the fat used is a low-melting-point vegetable oil;
- the sweeteners are a mixture of low-molecular-weight sweetening agents, with said mixture including dextrose and/or fructose, invert sugar, and glucose syrup.

According to another characteristic of the invention, the mixture of sweeteners includes:

- dextrose and/or fructose,
- invert sugar,
- glucose syrup,

and wherein,

- the invert sugar has a high equal inversion percentage, e.g., equal to 93, plus or minus 3;

- the glucose syrup has a dextrose equivalent on the order of 40%, e.g., ranging from 35 to 70%.

Other advantages and characteristics of the invention will emerge from reading the following description of the invention and its implementation method.

The frozen dessert of the invention is of the type made of a mixture of milk proteins, fats, and sweeteners.

This mixture is intended to be frozen after it is made and to be distributed while in a frozen state to the consumer, either in an individual portion size, or in a size that can be divided into individual portions, or in a pressurized package.

The individual portion size can be packaged in a single-unit form of packaging, such as a small pot.

Any other type of use may be implemented, such as filling for a frozen cake that is to be cut up, or other uses.

The product of the invention may also be distributed in UHT-treated liquid form and can be frozen by the user.

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The problem to be solved is:

- First, to make a product that, within the temperature range of -18° to -24°C, is both flexible enough for the product to be aerated by incorporating gas or for it to be pressurized by passing it through a nozzle for a receptacle inside which the product is packaged under pressure;

- Second, to make a product that is physically stable during the time period of its consumption while offering the organoleptic qualities of an ice cream.

The initial idea was to experiment with the three main components – sugars, fats, and proteins – by working with their relative percentages and the nature of said components and/or of the ingredients of each component in order to lower the mixture's freezing point.

It became clear that the protein ingredients mainly influence the ice cream's stability and texture, particularly as it exits the nozzle when it is being packaged in a pressurized container.

We found that the nature of the protein ingredients – skim milk or milk replacers –, the incorporation rate, and the composition of the protein ingredients have an influence on the ice cream's texture at freezing temperature.

During testing, we found that the amount of protein ingredients should range from 6% to 18%.

Below 6%, the product's texture is very fluid but it lacks resistance and stability.

Above 18%, the product is overly hard.

In the range of 6% to 18%, the product remains malleable and becomes harder as the amount of protein is increased.

The protein products may be milk replacers alone or a mixture of milk replacers and powdered skim milk, or the latter ingredient alone.

Advantageously, the milk replacers are powdered milk-origin products that are mainly composed of seric-origin proteins and include 20% to 40% protein.

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The percentages mentioned are given by weight.

Various sweeteners were tested as replacements for saccharose; these sweeteners had a lower molecular weight in order to lower the freezing point.

Three types of sweetener mixtures were developed for this purpose; they yield roughly the same result in terms of scoopable texture but differ in terms of taste.

The first mixture or first combination includes a total percentage of sugars expressed in relation to the overall formula of 24.6% dry ingredients, including:

- dextrose or fructose: 8.2%,
- invert sugar: 8.2%
- glucose syrup: 8.2%.

With this type of mixture, the sweet taste is quite noticeable.

The second mixture or second combination includes a total percentage of sugars expressed in relation to the overall formula of 20.3% dry ingredients, including:

- dextrose or fructose: 10.0%,
- invert sugar: 3.3%
- glucose syrup: 7.0%.

With this second type of mixture, the sweet taste is less intense than in the first.

The third mixture or third combination of sweeteners includes a total percentage of sugars expressed in relation to the overall formula of 20.3% dry ingredients, including:

- dextrose or fructose: 13.3%
- glucose syrup: 7.0%.

The glucose syrup used has a carbohydrate composition including roughly 49% glucose and 26% saccharides.

The invert sugar is characterized by a high degree of inversion (percentage of hydrolyzed saccharose), on the order of 93%, plus or minus 3%.

The glucose syrup used has an equivalent dextrose on the order of 70%, e.g., ranging from 69.7% to 73.7%.

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It is possible, within the scope of the invention, to use a glucose syrup with low-equivalent dextrose, e.g., between 35% and 70%; for example, the glucose syrups used may therefore have

an equivalent dextrose of around 40% and a glucidic composition with, for example, 15% dextrose and 10% disaccharides, and an equivalent dextrose of around 70% and a glucidic composition with, for example, 28% dextrose and 50% disaccharides, or 49% glucose and 26% disaccharides.

The various combinations of sweeteners are given in overall equivalent dextrose, by the percentage of monohydrate dextrose on the one hand, and the percentage of dextrose present in the glucose syrup on the other.

The combinations of sweeteners have, in common, their equivalent dextrose and it is possible, within the scope of the invention, to use a low-equivalent-dextrose glucose syrup.

The percentage of overall dextrose (originating from standard dextrose monohydrate and from glucose syrup) falls between 6% and 30%.

We have observed that the more we increase the dextrose percentage, the more flexible and malleable the obtained product is.

It is possible to use fructose as a partial or total substitute for the dextrose; the obtained result is satisfactory in terms of texture but is sweeter in taste.

Likewise, invert sugar may be used as a partial or total substitute for the dextrose and yields good results in terms of texture.

However, in this case, the pronounced sweet taste must be concealed by incorporating embittering agents, for example.

The fat used is one of the main factors affecting the final texture of the product and in obtaining a texture that is not too hard at freezing temperature.

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Various tests showed that the most suitable low-freezing-point fat was sunflower oil, which starts to solidify at -5 degrees Celsius and fully solidifies at about -25 degrees Celsius.

This oil is characterized by a low melting point.

The optimal incorporation percentages for producing the desired result range from 6% to 24%. Below 6%, the obtained product is too hard, which makes it unsuitable for packaging in a pressurized container.

Above 24%, the obtained product is malleable but has a ropy appearance and it begins to develop taste problems, with an overly-persistent fatty taste.

Between 6% and 24%, as the proportion of sunflower oil is increased, the ice cream becomes more flexible and fluid and its mouth-feel improves.

Needless to say, other vegetable fats with characteristics equivalent to those of sunflower oil may be used.

A composition for the type of product according to the invention may be as follows:

- sunflower oil: 16.5% to 18.5%,
- powdered skim milk:
  (or milk replacer): 11.6% to 10%,
- dextrose: 13.3%,
- glucose syrup: 8.8%,
- stabilizer: 0.6% to 0.3%,
- liquid skim milk: 49.0% to 49.1%.

In order to obtain a sufficiently flexible substance, it is preferable to combine a large amount of fats, when the amount of sweetener is at the low end of the range, and a large amount of sweetener when the amount of fat is at the low end of the range.

One may, for example, use the following compositions:

- sunflower oil: 20%	sunflower oil: 15%
- powdered skim milk: 11.6% (or milk replacer)	pwdr. skim milk: 11.6 (or milk replacer)

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- dextrose: 10%	dextrose: 15%
- glucose syrup: 8.8%	glucose syrup: 8.8%
- stabilizer: 0.6%	stabilizer: 0.6%
- liquid skim milk: 49%	liquid skim milk: 49%.

According to another embodiment of the invention, it is possible to integrate polyols or alcohol sugar into the composition.

By way of example, a sorbitol may be added in a proportion of 3 to 5%; in this case, the proportion of dextrose goes from 13.3% to 10.3%.

It has also proven to be possible to use substances such as polyols, ethanol, or even sugars such as galactose, that may lower the freezing point.

The ingredients are implemented by preparing all of the components in liquid form, namely liquid skim milk and sunflower oil.

The liquid components undergo hot mixing using a stirrer.

We then add the powdered skim milk and the powdered stabilizers.

The stabilizers are a mixture of fatty acid mono- and diglycerides with, optionally, carob, guar gum, carragenates, alginates, gelatin, etc.

The stabilizers are selected in order to adapt the frozen dessert’s texture and stabilization.

This addition is made while stirring. It is preferable to bring the mixture to a temperature of at least 65°C to 70° centigrade before adding the sugars, so that the stabilizing agents are well-solubilized.

The sugars are then added and the temperature is brought to or maintained at around 70°C.

The dry extract is then adjusted to around 45%, using water if necessary. It is also possible to heat only the liquid skim milk and to add the sunflower oil after the powdered skim milk and the stabilizer.

Next, the preparation is homogenized using a homogenizer in order to obtain a homogeneous distribution of small-diameter fat globules. Homogenization can be carried out before or after heat treatment.

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Homogenization is important for the product's stability when it is in unfrozen form.

It is also important for the product's final texture. One interesting technique for obtaining fat globules of the proper size without changing the texture is to create a preemulsion of all of the ingredients except the sweeteners.

Homogenization pressure should be between 25 bars and 200 bars.

The preparation then undergoes maturation for a time period that varies from a few hours to overnight, just above freezing, e.g., at +3°C. This maturation can be carried out at the same time that the product is being mixed.

The preparation can then be frozen directly using a joint overrun, or it can be UHT-treated and then placed inside a pressurized container and frozen.

The preparation may undergo UHT-type treatment directly through vapor injection or through vapor spraying.

Placing the product into a pressurized container can also be carried out directly after pasteurization or UHT treatment, with maturation and freezing occurring thereafter.

Freezing occurs in a refrigerated enclosure at between -18° and -24°C. The obtained product is stored in a refrigerated enclosure at a temperature ranging from -18° Celsius to -24° Celsius.

Depending upon how the product is to be marketed, the product can be packaged in a pot or in a pressurized container.

The pressurized containers may be of the siphon or aerosol container type. In these cases, an aerating gas is injected into the product; the gas is generally a neutral gas such as nitrous oxide.

A propellant gas, e.g. nitrogen, is also injected until the required pressure is reached inside the container.

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CLAIMS:

1. Frozen dessert whose composition includes milk proteins, fats, sweeteners, [and] one or more stabilizing agents, characterized in that:

- the proteins are provided by milk-origin milk replacer products and/or by skim milk having 20% to 40% protein in relation to the raw product;
- the fat is a vegetable oil with a low melting point;
- the sweeteners are made up of a mixture of low-molecular-weight sweetening agents, with said mixture containing dextrose and/or fructose, invert sugar, and glucose syrup.

2. Frozen dessert according to Claim 1, whose composition includes:

- milk proteins,
- fats,
- sweeteners,
- one or more stabilizers,

characterized in that:

- the proteins are provided by milk-origin milk replacer products and/or by skim milk having 20% to 40% protein in relation to the raw product;
- the sweeteners are made up of a mixture of low-molecular-weight sweetening agents, with said mixture containing:
- dextrose and/or fructose,
- invert sugar,

- glucose syrup, in which the invert sugar has a high inversion percentage on the order of 93, plus or minus 3, and the glucose syrup has an equivalent dextrose on the order of 70%.

3. Frozen dessert according to Claim 1 characterized in that:

- the milk replacers have 20% to 40% protein in relation to the raw product.

4. Frozen dessert according to Claim 1, characterized in that the vegetable oil is an oil with a low melting point.

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5. Frozen dessert according to Claim 1, characterized in that the vegetable oil is sunflower oil.

6. Frozen dessert according to Claim 1, characterized in that the invert sugar used is characterized by a high degree of inversion, on the order of 93, plus or minus 3.

7. Frozen dessert according to Claim 1, characterized in that the glucose syrup has an equivalent dextrose on the order of 70%.

8. Frozen dessert according to Claim 1, characterized in that the glucose syrup has a carbohydrate composition including 49% glucose and 26% saccharides.

9. Frozen dessert according to Claim 1 and any of claims 2 through 8, characterized in that it includes:

- sunflower oil: 16.5% to 18.5%,

- powdered skim milk:

  (or milk replacer): 11.6% to 10%,

- dextrose: 13.3%,

- glucose syrup: 8.8%,

- stabilizer: 0.6% to 0.3%,

- liquid skim milk: 49.0% to 49.1%.

10. Frozen dessert according to Claim 9, characterized in that the mixture of sweetening agents has a total percentage of sugars expressed in relation to the overall formula of 24.6% dry ingredients, including:

- dextrose or fructose: 8.2%,
- invert sugar: 8.2%
- glucose syrup: 8.2%.

11. Frozen dessert according to Claim 1 characterized in that the mixture of sweetening agents has a total percentage of sugars expresssed in relation to the overall formula of 20.3% dry ingredients, including:

- dextrose or fructose: 10.0%,
- invert sugar: 3.3%,

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- glucose syrup: 7.0%.

12. Frozen dessert according to claims 1 and 2 characterized in that the amount of protein ranges from 6 to 18%.

13. Frozen dessert according to Claim 1 characterized in that the stabilizing agent is incorporated in a proportion ranging from 0.25% to 0.8%.

14. Frozen dessert according to Claim 1 characterized in that the mixture of sweetening agents include total sugars expressed in relation to the overall formula of 20.3% dry ingredients, including:

- dextrose or fructose: 13.3%,

- glucose syrup: 7.0%.

15. Method for manufacturing a frozen dessert that implements the components in claims 1 through 14 characterized in that:

- the liquid skim milk and oil are mixed (in liquid form) and heated together;

- the powdered skim milk and the stabilizing agent are then added in, with the mixture being brought to a temperature that preferably ranges from 65°C to 70°C;

- the sweetening agents are preferably added when the mixture is at 70°C;

- the dry extract is adjusted so that it contains around 45% water, if necessary;

- the preparation is homogenized;

- the preparation undergoes maturation at a temperature just above freezing while stirring, if desired;

- the preparation is deep-frozen such that its final temperature ranges from -18°C to -24°C.

16. Manufacturing method according to Claim 15 characterized in that the mixture can be packaged while under pressure.

17. Manufacturing method according to claims 15 and 16 characterized in that the pressurized packaging occurs after the mixture is matured and prior to deep-freezing.

18. Manufacturing method according to claims 15 and 16 characterized in that the pressurized packaging occurs after deep-freezing and aeration.

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19. Manufacturing method according to Claim 15 characterized in that the mixture is packaged at atmospheric pressure in pots after it is deep-frozen and aerated.

20. Frozen dessert according to Claim 1 and any of claims 2 through 14, characterized in that the product is scoopable at minus 20° without requiring aeration.

21. Frozen dessert according to Claim 1 characterized in that percentage of overall dextrose in the sweeteners (originating from standard monohydrate dextrose and glucose syrup) is between 6% and 30%.

22. Frozen dessert according to claims 1 and 2 characterized in that the amount of fat is between 6% and 24%.

23. Frozen dessert according to claims 21 and 22 characterized in that the amount of fat is high when the amount of sweeteners is at the low end of the range.

24. Frozen dessert according to claims 21 and 22 characterized in that the amount of sweeteners is high when the amount of fat is at the low end of the range.

25. Frozen dessert according to Claim 1 characterized in that the glucose syrup has an equivalent dextrose ranging from 35% to 70%.

26. Frozen dessert according to Claim 1 characterized in that the glucose syrups used have an equivalent dextrose of around 40% and a glucidic composition of, e.g., 15% dextrose and 10% disaccharides.

27. Frozen dessert according to Claim 1 characterized in that the glucose syrups have an equivalent dextrose of around 70% and a glucidic composition with, e.g., 28% dextrose and 50% disaccharides or 49% glucose and 26% disaccharides.